

DEVICE FOR DAMPING MOVABLE FURNITURE PARTS

The present invention relates to a device for damping movable furniture parts, comprising an actuation part which is held so that it can be moved to and fro corresponding to the movement of a furniture part; a damper; and a gear stage for translating the movements of the actuation part into movements of the damper.

From EP 1 188 397 a spring-loaded closing device for drawers is known in which, during initial opening of a drawer, an axially slidable slider tensions a spring and locks it in the tensioned state. When the drawer is pushed in, the actuation part is taken by the drawer and released, so that the spring draws the drawer back completely. In this arrangement, a flange which is attached to the actuation part is guided in a slide guide which contains highly viscous grease. The use of highly viscous grease results in a damping of the movement.

Furthermore, from EP 1 120 066 a closing device for drawers is known in which a slidably guided actuation slide can be coupled to the drawer. By way of a tooth arrangement, the actuation slide activates a rotation damper via a gear pinion, with said rotation damper ensuring gentle closing of the drawer.

While such damping devices effect gentle closing of the drawer, their damping effect when the drawer is opened is nevertheless undesirable. In order to prevent the damping effect when the drawer is opened, the use of rotation dampers with unidirectional action has already been proposed. Such rotation dampers have a damping effect only in one direction, while in the opposite direction, which corresponds to pulling the drawer out, the damping effect is negligible. However, such rotation dampers are very expensive and thus not particularly suitable for mass production of corresponding furniture fittings.

It is thus the object of the present invention to create an improved damping device of the type mentioned in the introduction, which damping device avoids the disadvantages of the state of the art and advantageously improves said state of the art. Preferably, the damping device achieves a unidirectional damping effect by simple means, while in the opposite direction allowing movement which is largely free of damping.

According to the invention, this object is met by a damping device according to claim 1. Preferred embodiments of the invention are contained in the subordinate claims.

According to the invention, the gear stage between the actuation part and the damper is thus designed such that said gear stage only translates movements of the actuation part in one direction into damping movements, while not translating movements in the opposite direction into damping movements. To this effect, the gear stage contains an overrunning coupling which when the actuation part is moved in a first direction couples into a first direction, and when the actuation part is moved in a second direction, which is opposite to the first direction, uncouples. Preferably, as a result of this, economical dampers which are active in two directions can be used, without a damping effect actually occurring in two directions of movement. In particular, only closing movements of the actuation part are translated into movements of the damper, while when the furniture part is opened, the damper does not move.

In an improvement of the invention, the overrunning coupling is formed by a force-transmitting gear element of the gear stage which transmits driving forces in one direction of force flow onto a second gear element, with said force-transmitting gear element being movably held transversely to the direction of force flow of the driving forces, and by movement into one direction is uncoupled from the second gear element, while by movement in the opposite direction coupling into the second gearing element in a force-transmitting way.

In particular, the overrunning coupling can be formed by a gear wheel of the gear stage, wherein said gear wheel is seated on a gear shaft so that it is axially slidable, and by axial movement in a first direction can be engaged so as to be rotationally rigid in relation to the gear shaft, while by axial movement into the opposite direction it can be disengaged from the gear shaft. A particularly compact arrangement is achieved if the gear wheel is seated directly on the damper, which in this case is a rotation damper. By corresponding axial movement of the gear wheel, said gear wheel is disengaged from the housing of the rotation damper or is engaged respectively.

In order to be able to easily couple and uncouple the gear elements which cause the overrunning characteristics, the two gear elements advantageously comprise coupling engagement surfaces which are wedge-shaped, i.e. inclined at an acute angle in relation to the sliding direction of the gear element, with said coupling engagement surfaces being engageable and disengageable by relative movement of the two gear elements. The coupling engagement surfaces, which are arranged in a wedge-shaped manner, make it possible to achieve safe locking and unlocking with small actuating movements.

The overrunning coupling can be designed so as to couple entirely in a non-positive way. In the case where the gear wheel is seated on the gear shaft so as to be axially slidable, the gear wheel and/or the gear shaft can both comprise conical coupling engagement surfaces. During corresponding axial movement of the gear wheel, the conical inner surface area of the gear wheel is seated in a non-positive way on the conical outer surface area of the gear shaft which can be constituted by the housing of the rotation damper. If the gear wheel is axially displaced, the conical inner surface area is lifted from the conical outer surface area of the gear shaft. As a result of the conical shape of the coupling engagement surfaces, large forces of pressure can be generated with only small axial actuating forces, and thus large driving forces can be transmitted.

According to a further preferred embodiment of the invention, the overrunning coupling can also be designed so as to couple in a positive way. In the case where the gear wheel is seated on the gear shaft so as to be axially slidable, locating surfaces which are arranged in a wedge-shaped manner, i.e. which are inclined at an acute angle in relation to the rotary axis, can be provided on the gear wheel and/or on the gear shaft, by means of which locating surfaces the gear wheel and the gear shaft establish contact with each other. In particular, conical surface areas can be provided on the gear wheel and/or the gear shaft, with said conical surface areas comprising facet-shaped flattened regions which constitute the locating surfaces and which engage complementary flattened regions on the respective other part. Likewise, furrows, grooves or other locating surfaces which are suitable for creating positive engagement can be provided on the coupling engagement surfaces which are arranged in a wedge-shaped manner, for example to achieve rotationally rigid positive engagement with the gear shaft during corresponding axial movement of the gear wheel.

In an improvement of the invention, the actuating movement of the axially displaceable gear element for switching the overrunning action is caused automatically by movement of the gear stage. To this effect, the gear stage can comprise engagement means, in particular helical gearing, which engagement means, depending on the direction of movement of the gear stage, cause differently directed resulting forces to act on the axially slidable gear element. The engagement and disengagement forces acting on the overrunning coupling are thus formed by resulting transverse forces of the gear engagement. The running direction of the gear stage causes automatic switching of the overrunning coupling.

Preferably, the damper is a rotation damper which can be active in both directions. Because of the overrunning coupling built into the gear stage, the damper can be free of any restoring means. There is no need to turn the rotation damper back to its initial position every time. When the gear stage overruns during opening of the movable furniture part, the rotation damper simply comes to a halt in the respective position. As the gear stage couples again when the furniture part is closed anew, the rotation damper is simply turned onward correspondingly. This process is repeated, without the rotation damper ever being turned back. Thus, the rotation damper is only ever turned in one movement direction. There is no need for restoring springs.

In an improvement of the invention, the actuation part can be an axially slidable toothed rack profile which enmeshes with the gear wheel seated on the damper. In this arrangement, the gear stage can provide a speed increasing ratio in respect of the movement of the actuation part, which makes it possible to achieve adequate damper movement even in the case of small movements of the furniture part.

In a particularly advantageous way, the damping device is integrated in a closing device. The actuation part or a gear part connected to it, can be spring-loaded in the direction of closing. In particular, it can be provided for the spring to be tensioned when the furniture part is opened, wherein this preferably takes place during initial opening of the furniture part, after which the spring is locked and the actuation part uncouples from the furniture part so as to ensure unhindered movement for the remaining drawing-out distance. If the furniture

part is then closed again, the actuation part engages the furniture part again, the spring is unlocked and the furniture part is driven into the closed position by the spring. During this action, the damping effect of the damping device comes into play.

Below, the invention is explained in more detail with reference to a preferred embodiment and associated drawings. The drawings show the following:

- Fig. 1 a perspective view of a drawer guide fitting comprising a closing device which features a damping device according to a preferred embodiment of the invention;
- Fig. 2 a perspective view of the closing device from Fig. 1, wherein the closing device has been deinstalled from the guide fitting;
- Fig. 3 a lateral view of the closing device from Fig. 2;
- Fig. 4 a longitudinal section of the closing device from the preceding figures along line B-B in Fig. 3;
- Fig. 5 a cross section, from the preceding Figures, along line A-A in Fig. 4, of the damping device and the gear stage which drives the damping device
- Fig. 6 a lateral view of the closing device from the preceding figures with a housing half being cut off and the helical gearing of the gear stage being shown;
- Fig. 7 an exploded view of the rotation damper of the damping device from the preceding figures and the gear pinion driving said rotation damper;
- Fig. 8 an exploded view, similar to that in Fig. 7, of a rotation damper and the gear pinion driving said rotation damper in an alternative version of the invention to the version shown in Fig. 7, in which the surface areas which ensure engagement between the gear pinion and the rotation damper comprise facet-shaped flattened regions.

Figure 1 shows a furniture fitting in the form of a drawer guide 1. The vertical stay 3 of an essentially L-shaped supporting rail 2 can be attached to a furniture carcass, by means of suitable attachment means, for example in the form of drill holes 4. In a way known per se (not shown in further detail), a drawer is slidably held on the horizontal stay 5 of the supporting rail 2.

As shown in Figure 1, a closing device 6 is held on the supporting rail 2, wherein said closing device 6 by way of a catch 7 in the usual way (not shown) catches a gudgeon which is attached to the running rail or the drawer groove and interacts with said gudgeon.

The closing device 6 which is attached to the supporting rail 2 comprises an elongated supporting plate 8 which is connected to the horizontal web 5 of the supporting rail 2, as well as a cover 9 which is connected to the supporting plate 8 of the closing device 6 by means of drill holes 10 as well as suitable attachment gudgeons 11. Protruding from the housing of the closing device 6, which housing is formed by the supporting plate 8 and the cover 9, is the catch 7 which on the one hand comprises a transverse shaft 12 by means of which it is swivellably connected to an actuation part in the form of a slide 13, wherein the slide 13 is guided between the cover 9 and the supporting plate 8 so as to be longitudinally slidable. On the other hand, the catch 7, by way of a guide part in the form of a guide gudgeon 14, is guided in a guide track 15 designed in the way of a connecting link, with said guide track 15 being provided both in the cover 9 and in the supporting plate 8. As shown in Figure 3, the catch 7 is pretensioned by way of a spring 16 in a direction which corresponds to the closed position of the drawer. On one end the spring 16 is hooked into an attachment arm on the catch 7 and on the other end into the supporting plate 8.

Figures 3 to 6 show the catch 7 in a middle position between an opened position and a closed position.

The slide 13, which is only movable in one axis, comprises a toothed rack profile 17 which faces the supporting plate 8. In the region of the toothed rack profile 17, the supporting plate 8 comprises a recess as well as a damper housing 18 which is attached to the supporting plate 8, wherein said damper housing 18 protrudes downward from the supporting plate 8 and

accommodates a damper 19 which is a rotation damper. In this arrangement, the rotation axis 20 of the rotation damper 19 extends across the direction of travel of the slide 13, wherein the rotation damper 19 is transversely offset from the toothed rack profile 17. The damper 19 can be attached to the damper housing 18.

Figures 5 and 7 show the design of the damper 19 in more detail. The damper 19 comprises a rotation-symmetrical middle part 21, on each end adjoined by two protruding concentric cylinders 21', 21'', 41', 41'' which extend axially. The space between these cylinders is taken up by complementary cylinders 42, 43 of both anchor parts 22, which also extend axially, wherein a small gap remains between adjoining surfaces, in which gap high-viscosity grease exerts the damping or braking force.

The lateral disks 22 comprise end-stop parts 23 which protrude radially inward, with which end-stop parts 23 said lateral disks 22 are anchored in a positive way in recesses 24 of the damper housing 18 which overrun towards the top.

The gear wheel 26 is seated on the outer wall of the middle part 21 and in the installed state is contained in a lower recess 44 of the housing 18, wherein the wall 44' of said recess delimits its axial movement when it is disengaged.

Ring-shaped grooves 45 for accommodating o-rings 48 or the like can be provided on the outer wall 27 of the middle part 21. These o-rings 48 or the like serve not only to improve the friction between the gear wheel 26 and the wall 27 of the middle part, but also to form a temporary step-shaped counter end-stop 46 such that the gear wheel is firmly held in its engaged position as long as the helical gearing does not exert new disengagement force on said gear wheel.

It is understood that rotation dampers of a different design can be used.

A gear wheel 26 is seated directly on the rotatable part of the damper 19, which in the embodiment shown in the drawing is constituted by the outer wall of the middle part 21. The outer wall of the middle part 21 is formed by a gear shaft on which the gear wheel 26 with an interior recess is seated. As shown in Figure 7, the outer surface area 27 of the rotatable damper part as well as the inner

surface area 28 of the gear pinion 26 are of conical shape. If the gear pinion 26 is axially slid onto the conical surface area 27 of the damper 19, non-positive rotationally rigid engagement results so that rotary movement of the gear pinion 26 rotates the rotation damper as well. However, if the gear pinion 26 is moved in the opposite axial direction, the conical inner surface area 28 is lifted off the conical outer surface area 27, so that the gear pinion 26 is no longer in rotary engagement with the damper 19. The wedge-shaped design of the outer surface area of the rotatable part of the damper 19 as well as the complementary wedge-shaped design of the inner surface area 28 of the gear pinion 26 make possible coupling and uncoupling by means of very small axial movements of the gear pinion 26.

Axial coupling movement of the gear pinion 26 of the gear stage 29 is caused by helical gearing 30 by means of which the gear pinion 26 enmeshes the toothed rack profile 17 of the slide 13. As shown in Figure 6 both the gear pinion 26 and the toothed rack profile 17 comprise a helical gear arrangement, namely such that movements in the gear stage 29 cause axial movement on the gear pinion 26 which, when the drawer is being closed, pushes the gear pinion 26 onto the damper 19 thus locking with the rotatable part of the damper 19. In contrast to the above, during movement in the opposite direction, i.e. when the drawer is being opened, the helical gearing 30 causes movement of the gear pinion 26 in the opposite direction, which movement lifts said gear pinion 26 from the damper 19 and unlocks it from the rotary part of said damper 19. The gear element 26, which is lockable and unlockable with the damper 19, constitutes an overrunning coupling 31 which is integrated into the gear stage 29.

If the purely non-positive coupling between the gear pinion 26 and the rotatable part of the rotation damper 19 is not adequate, the gear pinion 26 as well as the rotatable middle part 21 of the damper 19 can each comprise complementary locating surfaces which positively engage each other. As shown in Figure 8, the outer surface area 27, which is of conical overall shape, of the rotatable middle part 21 of the damper 19 can comprise facet-like or wedge-shaped flattened regions 32. Correspondingly, the inner surface area 28 of the gear pinion 26 can be of somewhat conical shape and can thus comprise flattened regions 33 which are complementary to the flattened regions 32 of the middle part 21 and are also wedge-shaped. When the gear pinion 26 is slid onto the outer surface

area 27 of the middle part 21, the flattened regions 32 and 33 positively engage each other. When the gear pinion 26 moves in the opposite axial direction, the flattened regions 33 are lifted off the flattened regions 32 so that there is no longer a rotationally rigid engagement between the rotatable damper part and the gear pinion 26.